CITY OF ROCKVILLE

TRANSPORTATION NOISE STUDY
INTERIM REPORT

January 19, 2005

Prepared for

City of Rockville, Maryland

Prepared by

Rummel, Klepper & Kahl, LLP

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Executive Summary

Noise measurements were performed throughout the City of Rockville, MD from Thursday, September 23, 2004 through Wednesday, November 03, 2004 to evaluate existing noise levels and as a basis to predict residential noise impacts resulting from transportation facilities within City limits. The study concentrates on residential areas adjacent to major transportation corridors, and includes the following:

- Carter Road & Leverton Road (Hungerford)
- College Gardens
- Glenora Hills (Darnestown Road and Wootton Parkway)
- Nelson Street (West End Park)
- Norbeck Road (Croydon Park and Maryvale)
- Norbeck Road (Silver Rock and Twinbrook Forest)
- North Farm
- North Stonestreet Avenue & Frederick Avenue
- Twinbrook (NW)
- Twinbrook (SE)
- Watts Branch Parkway & Rose Hill Development

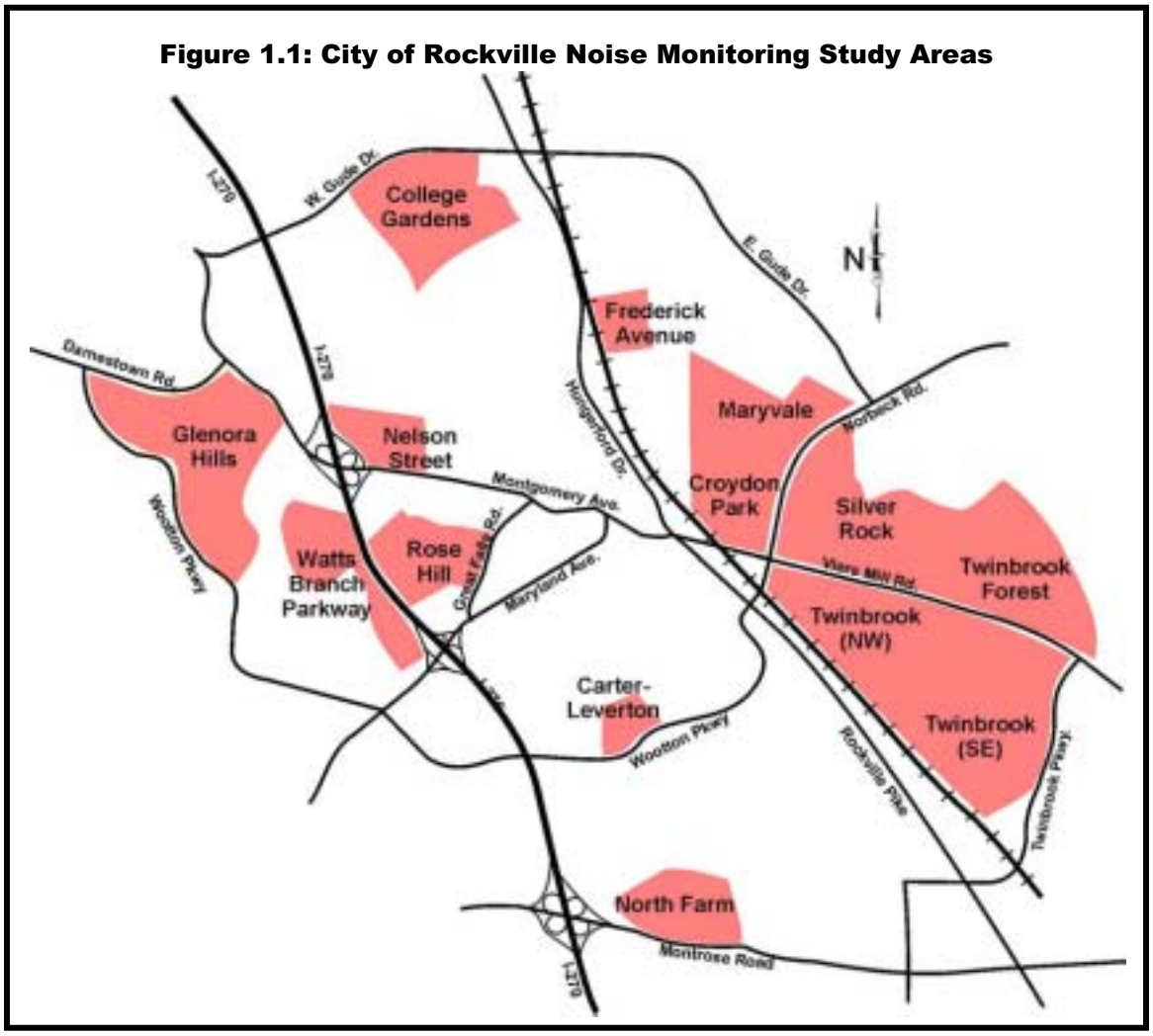
This report documents the noise measurements obtained in the above study areas.

1. Introduction

Project Description

This report presents the results of noise monitoring completed in several residential neighborhoods throughout the City of Rockville, MD between Thursday, September 23, 2004 and Wednesday, November 03, 2004. These study areas are shown in Figure 1.1: City of Rockville Noise Monitoring Study Areas, below:

Figure 1.1: City of Rockville Noise Monitoring Study Areas



Common Indoor and Outdoor Noise Levels

To correlate noise environments with community annoyance, a single-number noise descriptor called the equivalent sound level, L_{eq}, is commonly used. The L_{eq} is the value or level of a steady, non-fluctuating sound that represents the same amount of acoustical energy over a period of time as fluctuating sound over the same period of time. For traffic noise assessment, L_{eq} is typically evaluated over a one-hour period, and is denoted as $L_{eq[h]}$. As a point of reference, Table 1.1, below, shows several common sound levels from indoor and outdoor noise sources.

Table 1.1
Common Indoor and Outdoor Noise Levels

Common Outdoor Noise Levels	Noise Level (dBA)	Common Indoor Noise Levels
	110	Rock Band
Jet Flyover at 1,000 feet	100	Inside Subway Train (NY)
Gas Lawn Mower at 3 feet		
Diesel Truck at 50 feet	90	Food Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet
Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theater, Large Conference Room (Background)
Quiet Suburban Nighttime		Library
	30	
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	20	
		Broadcast & Recording Studio
	10	Threshold of Hearing
	0	

Adapted from Guide on Evaluation and Attenuation of Traffic Noise, AASHTO. 1974 (revised 1993).

City of Rockville Transportation Noise Impact Criteria

The most commonly used criterion for determining transportation noise impacts in residential areas is the loudest-hour equivalent sound level of sixty-six A-weighted decibels ($L_{eq(h)}$ = 66dBA). As shown in Table 1.1, above, 66dBA is approximately the sound level of normal speech at a distance of three feet, or approximately the sound level of a commercial area (outdoors). For 24-hour monitoring sessions, the loudest-hour equivalent sound level is the highest one-hour logarithmic average sound level over any whole-hour period. For short-term monitoring sessions, the loudest-hour equivalent sound level is calculated by adjusting the short-term equivalent sound level by the number of decibels separating the equivalent sound level obtained at the nearest[1] 24-hour receptor at the same time interval as the short-term monitoring data and the loudest-hour equivalent sound level obtained at the nearest 24-hour receptor.[2]

[1] The "nearest" 24-hour sound level monitoring location refers to the 24-hour receptor that obtained data with the highest statistical correlation, ψ, to the short-term monitoring data over the short-term monitoring session time interval.

[2] For example, if the L_{eq} at the "nearest" 24-hour receptor between 11:00 a.m. and 11:20 a.m. = 63dBA, but the loudest-hour L_{eq} at the "nearest" 24-hour receptor = 65dBA, then an equivalent sound level obtained at a correlating short-term receptor between 11:00 a.m. and 11:20 a.m. would be adjusted +2dBA (65dBA – 63dBA) to obtain the loudest-hour equivalent sound level ($L_{eq(h)}$) at the short-term receptor.

On Tuesday, November 16, 2004 the City of Rockville's Environmental Commission, the City of Rockville's Traffic & Transportation Commission, and representatives from Rummel, Klepper & Kahl, LLP met to discuss the procedures associated with the noise monitoring effort, the preliminary results and to define a noise level impact threshold. Following a discussion on the definition of transportation noise, impact criteria of adjacent governmental agencies, including Federal Highway Administration, Maryland State Highway Administration, Montgomery County and the Maryland National Capital Park and Planning Commission, the City's Commissions agreed to use the 66dBA loudest-hour equivalent sound level ($L_{eq(h)}$ = 66dBA) as the criterion for transportation noise impacts in exterior residential areas.

2. Noise Measurements

Noise measurements of the City of Rockville study area and classified traffic counts were completed in several noise monitoring sessions on each day noise monitoring data were obtained. All 24-hour noise monitoring data were obtained using Rion NL-06 Type 2 noise level meters; all short-term noise monitoring data were obtained using Metrosonics DB3080 Type 2 noise level meters. Microphones were set approximately 5 feet above ground elevation and oriented toward the dominant noise source for each monitoring location.

2.1 Carter Road & Leverton Road (Hungerford)

The Carter Road & Leverton Road study area consists of the southern end of the Hungerford neighborhood north of Wootton Parkway and east of Dogwood Park, as shown in Figure 2.1: Carter Road & Leverton Road (Hungerford) Study Area and Monitoring Locations, below:

Figure 2.1: Carter Road & Leverton Road (Hungerford) Study Area and Monitoring Locations

The dominant noise source at the intersection of Carter Road and Leverton Road is Wootton Parkway, which is elevated with respect to the 800 block of Leverton Road. Twenty-four hour noise monitoring data were obtained at three locations in the study area: at the intersection of Carter Road and Leverton Road, 811 Leverton Road, and 100' south of Leverton Road. Short-term noise monitoring data were obtained at two locations in the study area: 807 Leverton Road and 801 Leverton Road.

Table 2.1 – Noise Monitoring Data (dBA): Carter Road & Leverton Road (Hungerford)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
Carter & Leverton	59	79	61	56	60	55	24-hr farthest from Wootton Pkwy
811 Leverton	59	74	61	57	61	56	24-hr

Table 2.1 – Noise Monitoring Data (dBA): Carter Road & Leverton Road (Hungerford)							
100' S of Leverton	60	73	62	57	62	57	24-hr at nearest lot-line to source
801 Leverton*	54*	67	60*	52*	N/A	N/A	Short-term
807 Leverton*	55*	70	58*	52*	N/A	N/A	Short-term
All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.							
**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Carter & Leverton*							

Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 60dBA, below the 66dBA noise impact criteria. The statistical correlation between 24-hour monitoring data across the study area is very strong ($\psi_{L_{eq}}$ = 0.9, $\psi_{L_{max}}$ = 0.8, $\psi_{L_{10}}$ = 0.9, $\psi_{L_{90}}$ = 0.9), indicating that a common noise source (Wootton Parkway) dominates the overall noise condition.

Although Wootton Parkway dominates the overall noise condition, the noise monitoring data did not identify any noise impacts in the Carter Road & Leverton Road study area.

2.2 College Gardens

The College Gardens Study area consists of the College Gardens Neighborhood south of West Gude Drive, west of Yale Place, and north of College Parkway, as shown in Figure 2.2: College Gardens Study Area and Monitoring Locations, below:

Figure 2.2: College Gardens Study Area and Monitoring Locations

The dominant noise source to the College Gardens study area is West Gude Drive. Twenty-four hour noise monitoring data were obtained at two locations in the study area: 1304 Princeton Place, and at the top of the earth berm at the north end of Yale Place. Short-term noise monitoring data were obtained at four locations in the study area: the north end of Yale Place hiker-biker path, the intersection of Yale Place and Fordham Street, the intersection of College Parkway and Princeton Place, and the intersection of Princeton Place and Baylor Avenue.

Table 2.2 – Noise Monitoring Data (dBA): College Gardens

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
1304 Princeton Place	57	69	59	55	58	53	24-hr
Yale St – top of berm	71	91	74	64	71	68	24-hr
Yale St – H-B path	57*	64	60*	53*	N/A	N/A	Short-term
Yale & Fordham	53*	69	58*	50*	N/A	N/A	Short-term
College & Princeton	65**	87	72**	53**	N/A	N/A	Short-term
Baylor & Princeton	54**	72	58*	49**	N/A	N/A	Short-term

All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.

**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Yale Place – top of berm*

***Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at 1304 Princeton Place*

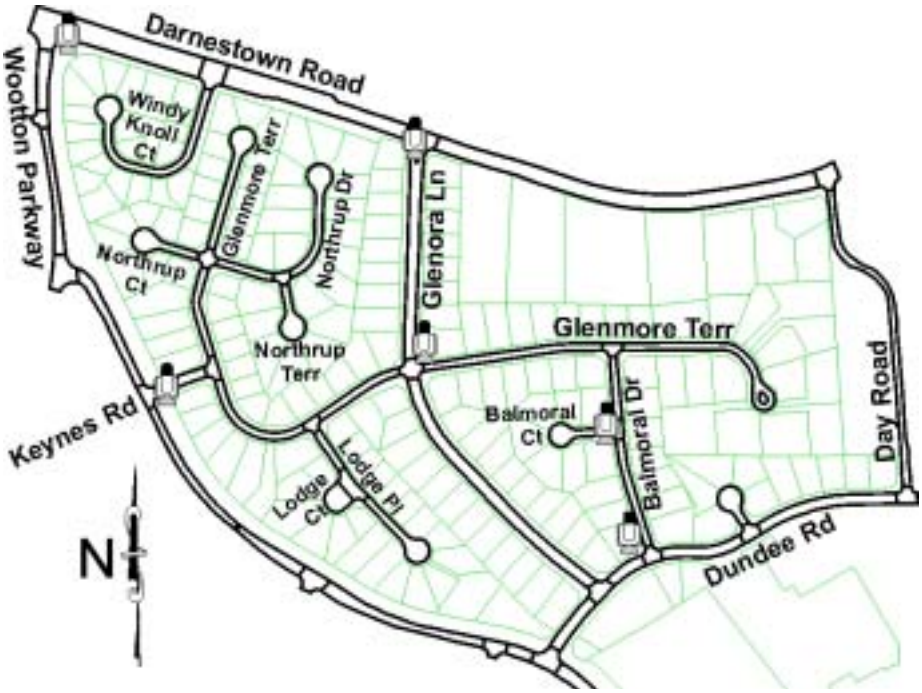
Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 57dBA, below the 66dBA noise impact criteria. The noise monitoring data shows an approximate 14dBA insertion loss from the West Gude Drive earth berm. The statistical correlation between 24-hour monitoring $L_{eq(h)}$, L_{10}, and L_{90} data across the study area is strong. However, maximum sound levels at 1304 Princeton Place have little correlation to maximum sound levels at the top of the West Gude Drive earth berm ($\psi_{L_{eq}}$ = 0.9, $\psi_{L_{max}}$ = 0.3, $\psi_{L_{10}}$ = 0.9, $\psi_{L_{90}}$ = 0.8). This indicates that a common noise source (West Gude Drive) dominates the overall noise condition throughout the northern end of College Gardens, but that noise sources that create the loudest short-term noise events at the top of the berm do not create the loudest short-term noise events at 1304 Princeton Place.

The noise monitoring data did not identify any noise impacts in the College Gardens study area.

2.3 Glenora Hills (Glenora Hills, Griffith Oaks, Rockshire)

The Glenora Hills study area consists of the northern sections of the Glenora Hills, Griffith Oaks, and Rockshire neighborhoods south of Darnestown Road and east of Wootton Parkway, as shown in Figure 2.3: Glenora Hills (Glenora Hills, Griffith Oaks, Rockshire) Study Area and Monitoring Locations, below:

Figure 2.3: Glenora Hills (Glenora Hills, Griffith Oaks, Rockshire) Study Area and Monitoring Locations



The dominant noise sources to the Glenora Hills study area are Darnestown Road and Wootton Parkway. Twenty-four hour noise monitoring data were obtained at two locations in the study area: the intersection of Wootton Parkway and Darnestown Road, and the intersection of Wootton Parkway and Keynes Road. Short-term noise monitoring data were obtained at four locations in the study area: the intersection of Glenora Lane and Glenmore Terrace, the intersection of Glenora Lane and Darnestown Road, the intersection of Balmoral Drive and Dundee Road, and the intersection of Balmoral Drive and Balmoral Court.

Table 2.3 – Noise Monitoring Data (dBA): Glenora Hills (Glenora Hills, Griffith Oaks, Rockshire)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
Wootton & Darnestown	71	88	74	67	70	67	24-hr. Top of berm
Wootton & Keynes	65	82	69	59	64	61	24-hr. Lot line on Keynes Rd.
Glenora Lane & Terr.	54*	77	61*	46*	N/A	N/A	Short-term. 1 block S of Darnestown.
Glenora & Darnestown	76*	87	79*	66*	N/A	N/A	Short-term. Lot-line on Glenora Ln.
Balmoral Dr. & Dundee	55**	70	60**	46**	N/A	N/A	Short-term.
Balmoral Dr. & Ct.	48**	68	52**	45**	N/A	N/A	Short-term.

Table 2.3 – Noise Monitoring Data (dBA): Glenora Hills (Glenora Hills, Griffith Oaks, Rockshire)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.							
**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Wootton Parkway & Darnestown Road*							
***Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Wootton Parkway & Keynes Road*							

Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 76dBA at the intersection of Glenora Lane and Darnestown Road. The statistical correlation between 24-hour monitoring data across the study area is strong (ψ_{Leq} = 1.0, ψ_{Lmax} = 0.7, ψ_{L10} = 1.0, ψ_{L90} = 0.8), indicating that noise along Wootton Parkway and noise along Darnestown Road fluctuates almost identically throughout the day. The noise monitoring data identified noise impacts in the study area along Glenora Lane in the vicinity of Darnestown Road.

The noise monitoring data did not identify any noise impacts along Wootton Parkway or within the interior sections of the Glenora Hills study area.

2.4 Nelson Street (West End)

The Nelson Street study area consists of the southwestern section of the West End neighborhood north of West Montgomery Avenue, west of Mannakee Street, and east of Interstate 270, as shown in Figure 2.4: Nelson Street (West End) Study Area and Monitoring Locations, below:

Figure 2.4: Nelson Street (West End) Study Area and Monitoring Locations

The dominant noise source to the Nelson Street study area is Interstate 270. Twenty-four hour noise monitoring data were obtained at three locations in the study area: 5 Nelson Street, 203 Nelson Street, and 9 Owens Court. Short-term noise monitoring data were obtained at two locations in the study area: the intersection of Mannakee Street 50' north of West Montgomery Avenue, and Mannakee Street 200' north of West Montgomery Avenue.

Table 2.4 – Noise Monitoring Data (dBA): Nelson Street (West End)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
5 Nelson St.	70	83	72	66	69	65	24-hour
203 Nelson St.	76	88	77	74	74	71	24-hour
9 Owens Ct.	69	83	72	64	71	66	24-hour
Mannakee – 50' N	66*	77	69*	63*	N/A	N/A	Short-term
Mannakee – 200' N	62*	76	67*	54*	N/A	N/A	Short-term

Table 2.4 – Noise Monitoring Data (dBA): Nelson Street (West End)							
Location	**$L_{eq(h)}$**	**L_{max}**	**L_{10}**	**L_{90}**	**L_{dn}**	**L_{eq24h}**	**Comment**
All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.							
**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at 5 Nelson Street.*							

Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 76dBA at 203 Nelson Street, significantly above the 66dBA noise impact criteria. The statistical correlation between 24-hour monitoring $L_{eq(h)}$, L_{10}, and L_{90} data across the study area is strong. However, maximum sound levels had little correlation ($\psi_{L_{eq}}$ = 0.9, $\psi_{L_{max}}$ = 0.3, $\psi_{L_{10}}$ = 1.0, $\psi_{L_{90}}$ = 0.9), indicating that a common noise source (Interstate 270) dominates the overall noise condition throughout the entire study area, and that noise sources that create the loudest short-term noise events at 5 Nelson Street do not create the loudest short-term noise events at 203 Nelson Street. The data support the conclusion that although Interstate 270 traffic noise dominates the overall sound environment along Nelson Street in its entirety, West Montgomery Avenue traffic noise provides maximum sound levels to the southernmost residences of Nelson Street.

The noise monitoring data identified noise impacts along West Montgomery Avenue, along Nelson Street, and for homes in the West End Park neighborhood within approximately 400 feet of Interstate 270.

2.5 Norbeck Road (Burgundy Knolls, East Rockville, Charles Walk, Maryvale, Redgate Farms)

The Norbeck Road (Burgundy Knolls, East Rockville, Charles Walk, Maryvale, Redgate Farms) study area consists of the residential areas southwest of East Gude Drive, north and west of Norbeck Road / First Street, and north of Veirs Mill Road, as shown in Figure 2.5: Norbeck Road (Burgundy Knolls, East Rockville, Charles Walk, Maryvale, Redgate Farms) Study Area and Monitoring Locations, below:

Figure 2.5: Norbeck Road (Burgundy Knolls, East Rockville, Charles Walk, Maryvale, Redgate Farms) Study Area and Monitoring Locations

The dominant noise source to the study area north and west of First Street/Norbeck Road is the highway itself. Twenty-four hour noise monitoring data were obtained at three locations in the study area: Maryvale Park, the intersection of First Street and Norbeck Road, and the intersection of Grandin Avenue

and First Street. Short-term noise monitoring data were obtained at four locations in the study area: 803 Grandin Avenue, 704 Grandin Avenue, the intersection of Baltimore Road and Grandin Avenue, and the intersection of Grandin Avenue and Croydon Avenue.

Table 2.5 – Noise Monitoring Data (dBA): Norbeck Road (Burgundy Knolls, East Rockville, Charles Walk, Maryvale, Redgate Farms)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
Maryvale Park	55	70	58	53	56	51	24-hour
First St & Norbeck	74	96	78	67	75	71	24-hour
Grandin & First Street	71	84	72	71	68	65	24-hour
803 Grandin	61*	69	65*	58*	N/A	N/A	Short-term
704 Grandin	54*	69	56*	52*	N/A	N/A	Short-term
Baltimore & Grandin	63*	79	70*	51*	N/A	N/A	Short-term
Croydon & Grandin	50*	67	54*	45*	N/A	N/A	Short-term
All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.							
**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Grandin Avenue and Norbeck Road.*							

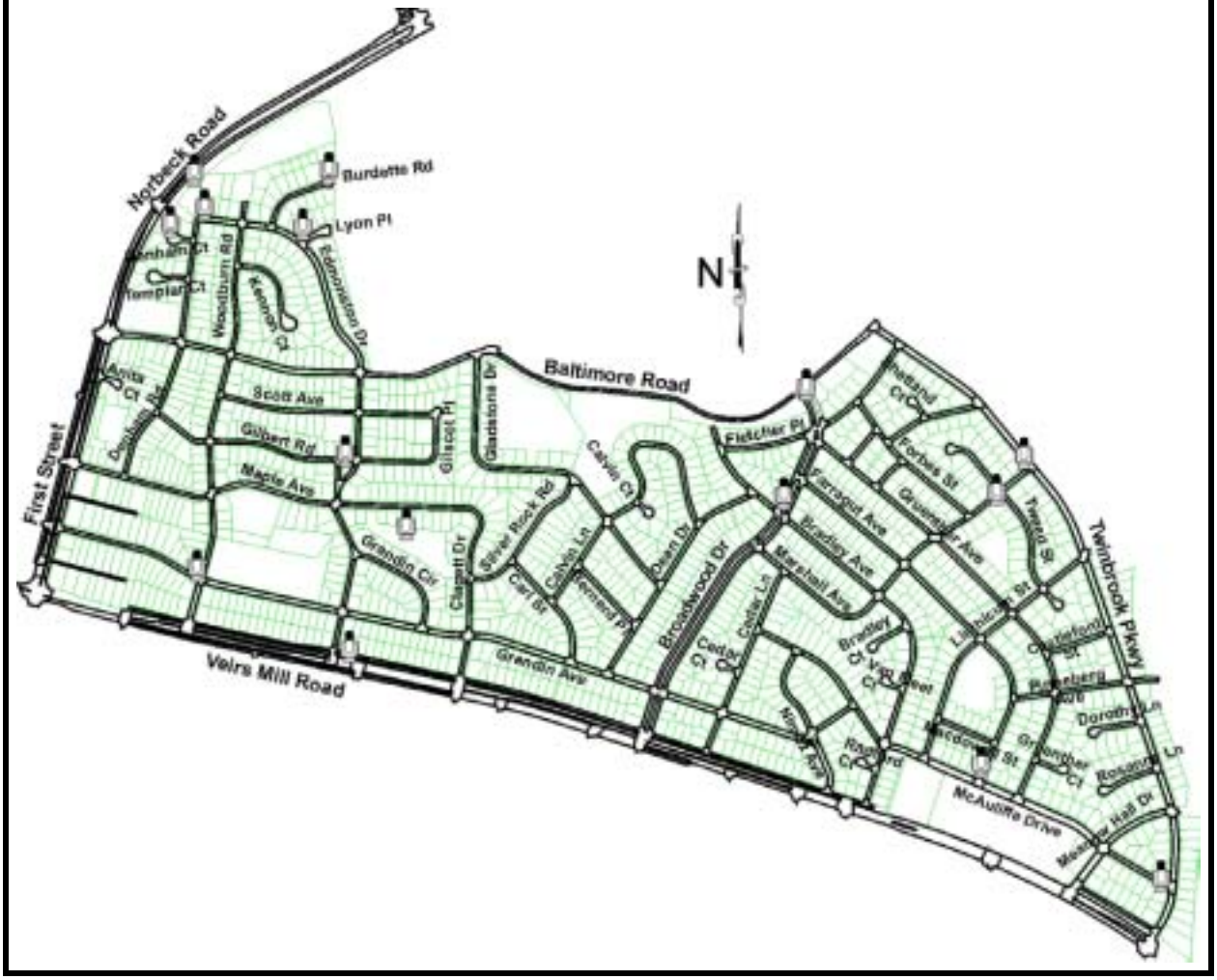
Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 71dBA for first-row residences north of Norbeck Road, above the 66dBA noise impact criteria. The statistical correlation between 24-hour monitoring data in the near vicinity of Norbeck Road is strong, (ψ_{Leq} = 0.8, ψ_{Lmax} = 0.7, ψ_{L10} = 0.9, ψ_{L90} = 0.7), indicating that Norbeck Road is the dominant noise source up to a distance of approximately 300 feet. However, since the loudest-hour equivalent sound level at Maryvale Park, $L_{eq(h)}$ = 55dBA, noise from Norbeck Road does not create noise impacts far from Norbeck Road. Furthermore, short-term monitoring at the intersection of Baltimore Road and Grandin Avenue indicates that local daytime traffic creates noise impacts to first-row residences along Baltimore Road.

The noise monitoring data identified noise impacts along First Street, and along Grandin Avenue, Baltimore Road, Robert Road, Maple Avenue, and Reading Avenue.

2.6 Norbeck Road (Burgundy Estates, Silver Rock, Twinbrook Forest)

The Norbeck Road (Burgundy Estates, Silver Rock, Twinbrook Forest) study area consists of the residential areas south and east of Norbeck Road / First Street, north of Veirs Mill Road, south of Baltimore Road, and west of Twinbrook Parkway, as shown in Figure 2.6: Norbeck Road (Burgundy Knolls, East Rockville, Charles Walk, Maryvale, Redgate Farms) Study Area and Monitoring Locations, below:

Figure 2.6: Norbeck Road (Burgundy Estates, Silver Rock, Twinbrook Forest) Study Area and Monitoring Locations



The dominant noise source to the study area south of Norbeck Road is Norbeck Road. Twenty-four hour noise monitoring data were obtained at three locations in the study area: 624 Denham Road adjacent to Norbeck Road, Silver Rock Park, and the intersection of Veirs Mill Road and Edmonston Road. Short-term noise monitoring data were obtained at twelve locations in the study area: Denham Court, the intersection of Edmonston Drive and Denham Road, the intersection of Edmonston Drive and Lyon Place, Burdette Road, the intersection of Edmonston and Gilbert Road, the intersection of Woodburn Road and

Grandin Avenue, Broadwood Drive and Baltimore Road, Broadwood Drive and Bradley Avenue, McAuliffe Drive and Farragut Avenue, McAuliffe Drive and Twinbrook Parkway, Marshall Avenue and Twinbrook Parkway, and Marshall Avenue and Tweed Street.

Table 2.6 – Noise Monitoring Data (dBA): Norbeck Road (Burgundy Estates, Silver Rock, Twinbrook Forest)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
624 Denham Road	66	88	69	61	67	64	24-hour
Silver Rock Park	53	69	56	51	52	48	24-hour
Veirs Mill & Edmonston	73	91	76	67	75	71	24-hour
Denham Court	60*	70	63*	57*	N/A	N/A	Short-term
Edmonston & Denham	62*	73	64*	58*	N/A	N/A	Short-term
Edmonston & Lyon	54*	65	59*	51*	N/A	N/A	Short-term
Burdette Road	53*	57	54*	51*	N/A	N/A	Short-term
Edmonston & Gilbert	55*	65	59*	50*	N/A	N/A	Short-term
Woodburn & Grandin	55**	67	59**	49**	N/A	N/A	Short-term
Broadwood & Balt.	60	76	65	47	N/A	N/A	Short-term
Broadwood & Bradley	55	73	62	46	N/A	N/A	Short-term
McAuliffe & Farragut	58**	74	63**	53**	N/A	N/A	Short-term
McAuliffe & Twinbrook	69**	83	73**	63**	N/A	N/A	Short-term
Marshall & Twinbrook	64**	78	68**	55**	N/A	N/A	Short-term
Marshall & Tweed	53**	68	56**	49**	N/A	N/A	Short-term

All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.

**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at 624 Denham Road*

***Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Veirs Mill Road & Edmonston Road*

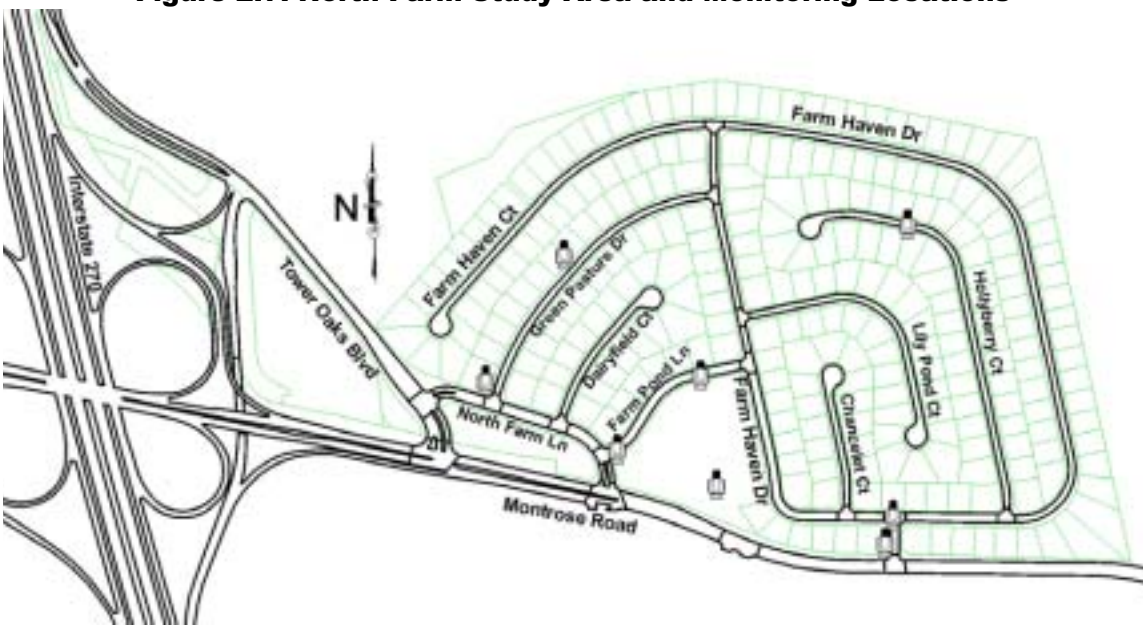
Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 73dBA at for first-row residences north of Veirs Mill Road, above the 66dBA noise impact criteria. Adjacent to Norbeck Road, noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 66dBA, equal to the 66dBA noise impact criteria. The statistical correlation between 24-hour monitoring data obtained adjacent to Norbeck Road and adjacent to Veirs Mill Road was strong (ψ_{Leq} = 0.9, ψ_{Lmax} = 0.6, ψ_{L10} = 0.9, ψ_{L90} = 1.0), indicating that traffic noise on Norbeck Road and Veirs Mill road fluctuates similarly throughout the hours of the day.

The noise monitoring data obtained throughout the study area identified noise impacts along Veirs Mill Road, as well as to first-row residences along Twinbrook Parkway near Veirs Mill Road.

2.7 North Farm

The North Farm study area consists of the North Farm Neighborhood north of Montrose Road and East of Interstate 270, as shown in Figure 2.7: North Farm Study Area and Monitoring Locations, below:

Figure 2.7: North Farm Study Area and Monitoring Locations



The dominant noise source to the North Farm study area is Montrose Road. Twenty-four hour noise monitoring data were obtained at three locations in the study area: 610 Farm Pond Lane, Farm Haven Park, and at the entrance to the North Farm neighborhood at the intersection of Montrose Road and North Farm Lane. Short-term noise monitoring data were obtained at five locations in the study area: Montrose Road and Farm Haven Drive, 1021 Farm Haven Drive, 30 Hollyberry Court, 416 Green Pasture Drive, and 400 Green Pasture Drive.

Table 2.7 – Noise Monitoring Data (dBA): North Farm

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
610 Farm Pond Lane	61	88	65	56	60	55	24-hour
North Farm & Mont	68	82	70	65	70	66	24-hour
Farm Haven Tennis Ct	64	78	67	61	66	62	24-hour
Mont & Farm Haven	75*	89	79*	70*	N/A	N/A	Short-term
1021 Farm Haven	64*	79	68*	57*	N/A	N/A	Short-term
30 Hollyberry	57**	66	61**	54**	N/A	N/A	Short-term
416 Green Pasture	55**	70	59**	51**	N/A	N/A	Short-term
400 Green Pasture	63*	82	66*	60*	N/A	N/A	Short-term

All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.

**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at North Farm Lane and Montrose Road.*

***Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at 610 Farm Pond Lane*

Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 75dBA for first-row residences north of Montrose Road, significantly above the 66dBA noise

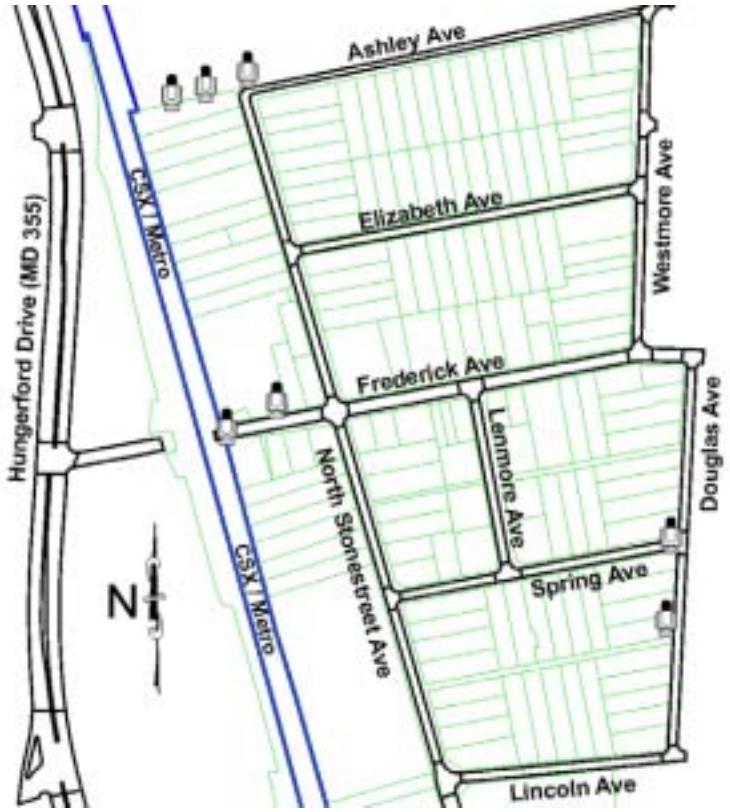
impact criteria. With the exception of L_{max} data, the statistical correlation between 24-hour monitoring data obtained approximately 100 feet north of Montrose Road and approximately 500 feet north at 610 Farm Pond Lane is strong ($\psi_{Leq} = 0.8$, $\psi_{Lmax} = 0.2$, $\psi_{L10} = 0.7$, $\psi_{L90} = 0.8$), indicating that although Montrose Road traffic noise is the dominant noise source throughout the study area, localized single noise events do occur within the neighborhood.

Noise monitoring data obtained throughout the study area identified noise impacts to first-row residences adjacent to Montrose Road, as well as noise impacts to second-row residences with unobstructed path to (view of) Montrose Road.

2.8 North Stonestreet Avenue – Frederick Avenue (Lincoln Park)

The North Stonestreet Avenue – Frederick Avenue study area consists of the area east of the CSX / Metro rail right-of-way between Lincoln Avenue and Ashley Avenue, as shown in Figure 2.8: North Stonestreet Avenue – Frederick Avenue (Lincoln Park) Study Area and Monitoring Locations, below:

Figure 2.8: North Stonestreet Avenue – Frederick Avenue (Lincoln Park) Study Area and Monitoring Locations



The dominant noise sources to the North Stonestreet Avenue – Frederick Avenue study area are the CSX and Metro rail lines. Twenty-four hour noise monitoring data were obtained at three locations in the study area: the western end of Frederick Avenue (nearest residential property lot-line), 112 Frederick Avenue, and the intersection of North Stonestreet Avenue and Ashley Avenue. Short-term noise monitoring data were obtained at four locations in the study area: 916 North Stonestreet Avenue – 100' west of the edge of pavement, 916 North Stonestreet Avenue – 200' west of the edge of pavement, 610 Douglas Avenue, and the intersection of Douglas Avenue and Spring Avenue.

Table 2.8 – Noise Monitoring Data (dBA): North Stonestreet Avenue - Frederick Avenue (Lincoln Park)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
Frederick Ave – end	84	112	87	77	85	78	24-hour
112 Frederick Ave	66	88	69	59	68	61	24-hour

Table 2.8 – Noise Monitoring Data (dBA): North Stonestreet Avenue - Frederick Avenue (Lincoln Park)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
N Stonestreet & Ashley	61	78	64	58	62	56	24-hour
916 N Stonestreet+100	60*	68	62*	58*	N/A	N/A	Short-term
916 N Stonestreet+200	63**	69	66**	60**	N/A	N/A	Short-term
610 Douglas Ave	57	76	61	50	N/A	N/A	Short-term
Douglas & Spring	53	70	58	48	N/A	N/A	Short-term

All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.

**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at North Stonestreet Avenue and Ashley Avenue.*

***Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at the west end of Frederick Avenue.*

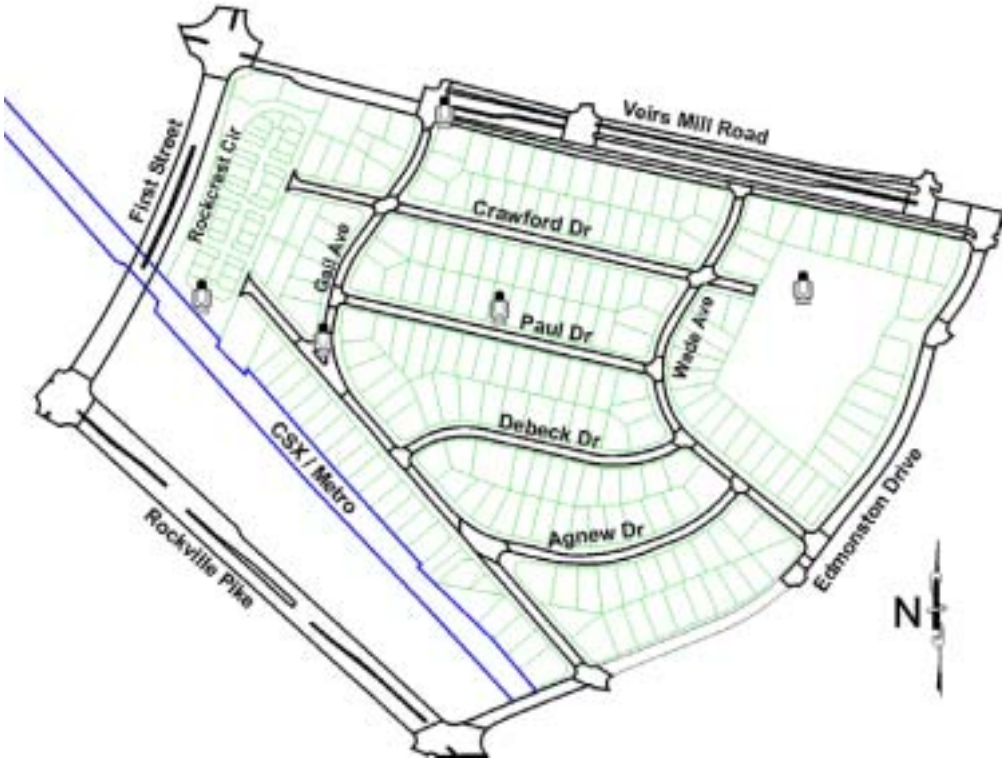
Noise monitoring data obtained at the nearest property lot line indicated a loudest-hour equivalent sound level, $L_{eq(h)}$ = 84dBA for first-row residences adjacent to CSX and Metro rail lines, above the 66dBA noise impact criteria. The statistical correlation between 24-hour monitoring data obtained at the western end of Frederick Avenue and 112 Frederick Avenue is strong (ψ_{Leq} = 0.8, ψ_{Lmax} = 0.7, ψ_{L10} = 0.7, ψ_{L90} = 0.8), indicating that the same noise source that creates the severe impacts to the residential properties adjacent to the rail lines also creates noise impacts to residential properties approximately 200' east. Transportation noise impacts to these residences result from rail transit, not from traffic noise. Since rail transit is periodic and urban/suburban traffic along primary corridors and highways is generally continuous, similar hourly equivalent sound levels from rail transit noise sources and automobile and truck traffic noise sources do not usually represent similar degrees of noise annoyance. An equivalent hourly sound level, $L_{eq(h)}$ = 70dBA from a rail transit noise source will generally be much more annoying than an equivalent hourly sound level, $L_{eq(h)}$ = 70dBA from an automobile/truck traffic noise source because the rail noise source will include incremental sound levels with a much greater range of intensities than the automobile/truck traffic noise source.

Noise monitoring data obtained throughout the study area identified noise impacts to the residences in the 100-block of Frederick Avenue, and to the even-numbered residences along the west side of North Stonestreet Avenue.

2.9 Twinbrook (Rockcrest Courts, NW Twinbrook)

The Twinbrook (Rockcrest Courts, NW Twinbrook) study area consists of the area northeast of the CSX / Metro rail right-of-way, south of Veirs Mill Road, east of First Street and west of Edmonston Drive, as shown in Figure 2.9: Twinbrook (Rockcrest Courts, NW Twinbrook) Study Area and Monitoring Locations, below:

Figure 2.9: Twinbrook (Rockcrest Courts, NW Twinbrook) Study Area and Monitoring Locations



The dominant noise sources to the Twinbrook study area are the CSX and Metro rail lines to the southwest, and Veirs Mill Road to the north. Twenty-four hour noise monitoring data were obtained at three locations in the study area: Lewis Avenue and Gail Avenue, Veirs Mill Road and Gail Avenue, and Rockcrest Circle at the CSX/Metro Rail right-of-way fence. Short-term noise monitoring data were obtained at two locations in the study area: Hillcrest Park and 1010 Paul Drive.

Table 2.9 – Noise Monitoring Data (dBA): Twinbrook (Rockcrest Courts, NW Twinbrook)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
Lewis & Gail	59	82	64	55	63	57	24-hour
Veirs Mill & Gail	81	100	85	70	78	75	24-hour
Rockcrest & RR Tracks	83	115	83	71	80	75	24-hour
Hillcrest Park	59*	70	62*	56*	N/A	N/A	Short-term
1010 Paul Drive	53*	59	53*	52*	N/A	N/A	Short-term

All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.

**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Lewis Avenue and Gail Avenue.*

Noise monitoring data obtained at the properties adjacent to the CSX – Metro Rail lines indicates that these properties are impacted, with a loudest-hour equivalent sound level, $L_{eq(h)}$ = 83dBA, above the 66dBA noise impact criteria. Noise monitoring data obtained at the properties adjacent to the eastbound lanes of Veirs Mill Road are also severely impacted, with a loudest-hour equivalent sound level, $L_{eq(h)}$ = 81dBA, also greater than the 66dBA noise impact criteria. There is no statistical correlation between 24-hour monitoring data obtained at the intersection of Veirs Mill Road and Gail Avenue and Rockcrest Circle at the CSX/Metro Rail right-of-way fence (ψ_{Leq} = -0.2, ψ_{Lmax} = -0.2, ψ_{L10} = -0.1, ψ_{L90} = -0.4), indicating that the two dominant noise sources are unrelated, and create noise impacts to the study area independently of each other. The rail transit noise impacts along the odd-numbered Lewis Avenue residences adjacent to the CSX/Metro Rail lines experience greater noise annoyance due to the periodic passage of trains over the rail lines than do the impacted residences along Veirs Mill Road that are exposed to constant automobile/truck traffic noise.

Noise monitoring data obtained throughout the study area identified noise impacts along Veirs Mill Road, to the odd-numbered homes along Lewis Avenue, and to the homes along Rockcrest Circle adjacent to First Street.

2.10 Twinbrook (SE Twinbrook)

The Twinbrook (SE Twinbrook) study area consists of the area northeast of the CSX / Metro rail right-of-way, south of Veirs Mill Road, southeast of Edmonston Drive, northwest of Halpine Road, and west of Twinbrook Parkway, as shown in Figure 2.10: Twinbrook (SE Twinbrook) Study Area and Monitoring Locations, below:

Figure 2.10: Twinbrook (SE Twinbrook) Study Area and Monitoring Locations

The dominant noise sources to the Twinbrook (SE Twinbrook) study area are the CSX and Metro rail lines to the southwest, and Veirs Mill Road to the north. Twenty-four hour noise monitoring data were obtained at three locations in the study area: 1627 Lewis Avenue (on Lewis Avenue, not on the CSX/Metro Rail right-of-way fence), Twinbrook Park, and the intersection of Halpine Road and Lewis Avenue. Short-term noise monitoring data were obtained at four locations in the study area: the intersection of Veirs Mill Road and Okinawa Avenue, the intersection of St Lo Avenue and Okinawa Avenue, the intersection of Rockland Avenue and Matthews Drive, and the intersection of Rockland Avenue and Ridgeway Avenue.

Table 2.10 – Noise Monitoring Data: Twinbrook (SE Twinbrook)							
Location	**$L_{eq(h)}$**	**L_{max}**	**L_{10}**	**L_{90}**	**L_{dn}**	**L_{eq24h}**	**Comment**
1627 Lewis Avenue	64	90	69	56	65	61	24-hour
Twinbrook Park	58	74	59	57	63	56	24-hour
Halpine & Lewis	83	115	83	71	80	75	24-hour
Veirs Mill & Okinawa	77*	85	81*	70*	N/A	N/A	Short-term
St Lo & Okinawa	53*	56	54*	52*	N/A	N/A	Short-term
Rockland & Matthews	53**	68	56**	50**	N/A	N/A	Short-term
Rockland & Ridgeway	52**	67	55**	50**	N/A	N/A	Short-term
All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.							
**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at Veirs Mill Road and Okinawa Avenue.*							
***Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at 1627 Lewis Avenue.*							

Noise monitoring data obtained at the properties adjacent to the CSX/Metro Rail lines indicates that these properties are severely impacted, with a loudest-hour equivalent sound level, $L_{eq(h)}$ = 83dBA, significantly above the 66dBA noise impact criteria. Noise monitoring data obtained at the properties adjacent to the eastbound lanes of Veirs Mill Road are also severely impacted, with a loudest-hour equivalent sound level, $L_{eq(h)}$ = 77dBA. There is no statistical correlation between 24-hour monitoring data obtained at the intersection of Veirs Mill Road and Okinawa Avenue and the intersection of Halpine Road and Lewis Avenue (ψ_{Leq} = -0.1, ψ_{Lmax} = -0.1, ψ_{L10} = -0.2, ψ_{L90} = 0.3), indicating that the two dominant noise sources are unrelated, and create noise impacts to the study area independently of each other. Furthermore, it is notable that although the properties on the odd side of Lewis Avenue are severely impacted where adjacent to CSX/Metro Rail, the properties on the even side of Lewis Avenue are not. The rail transit noise impacts along the odd-numbered Lewis Avenue residences adjacent to the CSX/Metro Rail lines experience greater noise annoyance due to the periodic passage of trains over the rail lines than do the impacted residences along Veirs Mill Road that are exposed to constant automobile/truck traffic noise.

Noise monitoring data obtained throughout the study area identified noise impacts along Veirs Mill Road, and to the odd-numbered homes along Lewis Avenue.

2.11 Watts Branch Parkway – Rose Hill Development (Rockshire, Fallswood, Saddlebrook, Rose Hill, Rose Hill Falls)

The Watts Branch Parkway – Rose Hill Development (Rockshire, Fallswood, Saddlebrook, Rose Hill, Rose Hill Falls) study area consists of the eastern portions of the Rockshire, Fallswood, and Saddlebrook neighborhoods adjacent to the southbound lanes of Interstate 270, and the Rose Hill and Rose Hill Falls neighborhoods east of Interstate 270 and west of Great Falls Road, as shown in Figure 2.11: Watts Branch Parkway – Rose Hill Development (Rockshire, Fallswood, Saddlebrook, Rose Hill, Rose Hill Falls) Study Area and Monitoring Locations, below:

Figure 2.11: Watts Branch Parkway – Rose Hill Development (Rockshire, Fallswood, Saddlebrook, Rose Hill, Rose Hill Falls) Study Area and Monitoring Locations

The dominant noise source to the Watts Branch Parkway and Rose Hill Development Study areas is Interstate 270. Noise monitoring was completed in both study areas on the same day to assess the performance of the sound wall noise barrier protecting the residences adjacent to the southbound lanes of Interstate 270. Twenty-four hour noise monitoring data were obtained at three locations in the Watts Branch Parkway study area: 520 Watts Branch Parkway, the intersection of Loch Ness Court and Watts Branch Parkway, and 14 Ingleside Court at the lot-line nearest to Interstate 270. Short-term noise monitoring data were obtained at eighteen locations in the study area: 9 Grovepoint Court, 3 Grovepoint Court, Woodsend Place and Woodsend Court, Approximately 120 feet west of 520 Watts Branch Parkway (approximately twice the distance from Interstate I-270 as the first 24-hour receptor location), 428 Watts Branch Parkway, 3 Fallswood Court, the intersection of Fallswood Court and Watts Branch Parkway, 1418 Fallswood Drive, 1405 Fallswood Drive, the intersection of Winding Rose Drive and Winding Rose Drive, Approximately 200 feet east of Interstate 270 (approximately one-half the distance from Interstate 270 as the short-term receptor location at Winding Rose Drive and Winding Rose Drive), the intersection of Winding Rose Drive and Blue Hosta Way, 20 Blue Hosta Way, the tennis courts at Blaze Climber Circle, the intersection of Winding Rose Drive and Nocturne Court, the intersection of Rose Petal Way and Great Falls Road, and the intersection of Rose Petal Way and Autumn Wind Way.

Table 2.11 – Noise Monitoring Data: Watts Branch Parkway / Rose Hill Development (Rockshire, Fallswood, Saddlebrook, Rose Hill, Rose Hill Falls)

Location	$L_{eq(h)}$	L_{max}	L_{10}	L_{90}	L_{dn}	L_{eq24h}	Comment
520 Watts Branch	66	78	66	65	68	63	24-hour. Impacted
Loch Ness & Watts Br	66	81	68	64	67	63	24-hour. Impacted
14 Ingleside Ct	68	81	69	67	71	66	24-hour. Impacted
9 Grovepoint Ct	56	62	56	55	N/A	N/A	Short-term. Not impacted
3 Grovepoint Ct	54	68	55	54	N/A	N/A	Short-term. Not impacted
9 Woodsend Pl	62*	67	62*	61*	N/A	N/A	Short-term. Not impacted
Woodsend Pl & Ct	61*	54	61*	60*	N/A	N/A	Short-term. Not impacted
120' W of 520 Watts B	65	69	66	64	N/A	N/A	Short-term. Not impacted
428 Watts Branch	68	71	68	67	N/A	N/A	Short-term. Impacted
3 Fallswood Ct	61	76	61	59	N/A	N/A	Short-term. Not impacted
Fallswood Ct & WB	67	71	68	66	N/A	N/A	Short-term. Impacted
1418 Fallswood Dr	55*	64	57*	53*	N/A	N/A	Short-term. Not impacted
1405 Fallswood Dr	59*	68	61*	57*	N/A	N/A	Short-term. Not impacted
Winding Rose	65*	69	67*	65*	N/A	N/A	Short-term. Not impacted
200' E of I-270	68*	76	68*	65*	N/A	N/A	Short-term. Impacted
Winding Rose-Bl Hosta	69*	72	70*	67*	N/A	N/A	Short-term. Impacted
20 Blue Hosta	63*	66	63*	62*	N/A	N/A	Short-term. Not impacted
Blaze Climber Tennis	64*	67	65*	63*	N/A	N/A	Short-term. Not impacted
Winding Rose-Nocturn	57*	74	63*	50*	N/A	N/A	Short-term. Not impacted
Rose Petal & Gr Falls	68	84	74	58	N/A	N/A	Short-term. Impacted
Rose Petal & Autmn W	53*	60	55*	47*	N/A	N/A	Short-term. Not impacted

All data in A-weighted decibels (dBA). $L_{eq(h)}$, L_{10} and L_{90} represent the highest 1-hour levels from the monitoring data.

**Adjusted to correspond to loudest-hour data obtained at nearest 24-hour monitor at 520 Watts Branch Parkway.*

Noise monitoring data obtained at the properties adjacent to the southbound lanes of Interstate 270 indicates that although these properties are protected by a sound barrier noise wall, they are still impacted by Interstate 270 traffic noise, with a loudest-hour equivalent sound level, $L_{eq(h)}$ = 68dBA, above the 66dBA noise impact criteria. However, the data do not indicate or identify the reductions or insertion losses are attributable to the existing sound barrier noise wall; however, it is likely that without the sound barrier noise wall, the noise levels along Watts Branch Parkway would be significantly higher. Noise monitoring data obtained at the properties adjacent to the northbound lanes of Interstate 270 also indicate noise levels greater than 66dBA. Finally, Great Falls Road traffic is a source of noise impacts to residential properties adjacent to the roadway, with a loudest-hour $L_{eq(h)}$ = 68dBA.

Noise monitoring data obtained throughout the study area identified noise impacts along Watts Branch Parkway, Ingleside Court, Marwood Court, and Great Falls Road.

3. Existing Noise Impacts

Transportation noise impacts a receptor if the transportation noise source projects sound energy such that the average sound level of the loudest hour of the day at the receptor exceeds 66 A-weighted decibels (66dBA) at ground level elevations, or for the ground level floor of multi-story residential buildings. The noise monitoring data obtained in the City of Rockville, MD between Thursday, September 23, 2004 and Wednesday, November 03, 2004 identified several transportation noise sources that create noise impacts to residences. Table 3.1 is a compilation of transportation noise impacts identified within the study area.

Table 3.1 City of Rockville Residential Noise Impacts

Study Area	$L_{eq(h)}$*	Source	Impacts
North Stonestreet Avenue	84	CSX/Metro Rail	North Stonestreet Avenue, Frederick Avenue
Twinbrook (NW)	83	CSX/Metro Rail	Lewis Avenue, Rockcrest Circle
	81	Veirs Mill Road	Veirs Mill Road, Gail Avenue, Wade Avenue, Edmonston Drive, and Claggett Drive
Twinbrook (SE)	83	CSX/Metro Rail	Lewis Avenue
	77	Veirs Mill Road	Veirs Mill Road, Coral Sea Drive, Abbott Road, Broadwood Drive, Okinawa Avenue, Ardennes Drive, and Midway Avenue
Glenora Hills	76	Darnestown Road	Darnestown Road, Glenora Lane near Darnestown Road
Nelson Street (West End)	76	Interstate 270	Nelson Street, Owens Court, Owens Street, Anderson Avenue, Beall Avenue
	66	West Montgomery Avenue	West Montgomery Avenue, Mannakee Street
North Farm	75	Montrose Road	Farm Haven Drive, Green Pasture Lane, Dairy Field Court, and Farm Pond Lane
Norbeck Road (Croydon Park, Maryvale)	74	Norbeck Road	Norbeck Road, First Street, Redgate Farms Court, Allan Road, Robert Road, Baltimore Road, Reading Avenue, Maple Avenue and Grandin Avenue
Norbeck Road (Silver Rock, Twinbrook Forest)	73	Veirs Mill Road	Veirs Mill Road, Edmonston Road, Broadwood Drive, Woodburn Road, Claggett Drive, Cedar Lane
	66	Norbeck Road	Denham Road, Denham Court, Baltimore Road, Maple Avenue, Grandin Avenue
	69	Twinbrook Parkway	McAuliffe Drive, Meadow Hall Drive, Roseanne Lane, Dorothy Lane, and Pinneburg Avenue
Watts Branch Parkway – Rose Hill Development	69	Interstate 270	Watts Branch Parkway, Ingleside Court, Marwood Court, Chantilly Court, Blue Hosta Way
	68	Great Falls Road	Great Falls Road

**All measurements indicate the loudest whole hour equivalent sound levels, $L_{eq(h)}$, in A-weighted decibels, dBA*

3.1 Carter Road & Leverton Road (Hungerford)

The dominant transportation noise source to the Carter Road and Leverton Road (Hungerford) study area is Wootton Parkway. Sound level monitoring data were obtained at the residential lot-line of 811 Leverton Road (the residential lot-line nearest to Wootton Parkway), at the intersection of Leverton Road and Carter Road, at the southern end of Leverton Road, as well as several other monitoring locations within the study area. None of the sound level data identified any one-hour equivalent sound levels, $L_{eq(h)}$, greater than 66dBA.

3.2 College Gardens

The dominant noise source to the College Gardens study area is West Gude Drive; however, an earth berm noise barrier mitigates West Gude Drive traffic noise, effectively reducing loudest-hour equivalent noise levels, $L_{eq(h)}$, in the College Gardens study area are below the 66dBA impact criteria threshold. Noise monitoring data obtained at the top of the earth berm noise barrier, at the base of the neighborhood side of the berm at Yale Place, and at the intersection of Yale Place and Fordham Street indicates that the noise level reduction from the earth berm is approximately 14dBA. College Parkway is a lesser source of transportation noise to the southern limits of the College Garden neighborhood and the Plymouth Woods neighborhood. Although the loudest-hour equivalent noise levels at the residential lot-lines along College Parkway are louder than at other residences within the study area, College Parkway traffic does not create noise impacts to these residences.

3.3 Glenora Hills (Glenora Hills, Griffith Oaks, Rockshire)

The dominant noise sources to the Glenora Hills study area are Wootton Parkway to the west and Darnestown Road to the north. An earth berm noise barrier protects residences adjacent to Wootton Parkway and in the southeast quadrant of the intersection of Darnestown Road and Wootton Parkway. Darnestown Road traffic noise does impact residences adjacent to Darnestown Road not protected by the earth berm sound barrier.

3.4 Nelson Street (West End)

Interstate 270 traffic noise impacts residential properties on Nelson Street with measured loudest-hour equivalent sound levels, $L_{eq(h)}$, equal to 76dBA. Properties up to 400 feet east of Interstate 270, including the properties of Owens Street and Owens Court are also impacted, with measured $L_{eq(h)}$ equal to 69dBA. Traffic noise impacts to residences on Nelson Street nearer to West Montgomery Avenue are lesser in magnitude due to the existing topography – the elevation of Nelson Street rises higher than the elevation of Interstate 270 as Nelson Street approaches West Montgomery Avenue. However, local traffic noise also impacts first-row residences adjacent to West Montgomery Avenue, with measured $L_{eq(h)}$ = 66dBA.

3.5 Norbeck Road (Burgundy Knolls, East Rockville, Charles Walk, Maryvale, Redgate Farms)

Norbeck Road traffic noise creates noise impacts to the first- and second-row residences on Norbeck Road, First Street, Redgate Farms Court, Allan Road, Robert Road, Baltimore Road, Reading Avenue, Maple Avenue and Grandin Avenue. Baltimore Road traffic noise is a secondary source within the study area; however, loudest-hour equivalent sound levels at the obtained at the intersection of Baltimore Road and Croydon Avenue, $L_{eq(h)}$, is 65dBA – below the 66dBA impact criteria.

3.6 Norbeck Road (Burgundy Estates, Silver Rock, Twinbrook Forest)

Norbeck Road and Veirs Mill Road are dominant noise sources to the western and southern borders of the study area, respectively. Residences adjacent to Veirs Mill Road and Norbeck Road are impacted; however, second-row residences are not. Twinbrook Parkway traffic noise is a lesser source, but does create noise impacts with loudest-hour equivalent sound levels, $L_{eq(h)}$, greater than or equal to 66dBA for the residences adjacent to Twinbrook Parkway in the vicinity of Veirs Mill Road, McAuliffe Drive, Meadow Hall Drive, Roseanne Lane, Dorothy Lane, and Pinneburg Avenue.

3.7 North Farm

The dominant noise source to the North Farm study area is Montrose Road. Traffic noise impacted residences on Farm Haven Drive adjacent to Montrose Road, on Farm Haven Drive with an unobstructed view of Montrose Road (e.g. 1021 Farm Haven Drive), and near North Farm Lane on Green Pasture Drive, Dairy Field Court, and Farm Pond Lane.

3.8 North Stonestreet Avenue – Frederick Avenue (Lincoln Park)

CSX/Metro rail transit noise impacts residences adjacent to the rail facility on the west side of North Stonestreet Avenue and throughout the 100-block of Frederick Avenue. Local traffic noise from within the study area and traffic noise from Hungerford Drive (MD 355) is a lesser source and does not create any noise impacts to the study area.

3.9 Twinbrook (Rockcrest Courts, NW Twinbrook)

Veirs Mill Road traffic noise and CSX/Metro rail transit noise are the two dominant noise sources to the northern and southwestern borders of the study area, respectively. CSX/Metro rail transit noise impacts the odd-numbered residences of Lewis Avenue, whereas Veirs Mill Road traffic noise impacts the odd-numbered residences of Veirs Mill Road, as well as the residences on Gail Avenue, Wade Avenue, Edmonston Drive, and Claggett Drive that are nearest to Veirs Mill Road.

3.10 Twinbrook (SE Twinbrook)

Veirs Mill Road traffic noise and CSX/Metro rail transit noise are the two dominant noise sources to the northern and southwestern borders of the study area, respectively. CSX/Metro rail transit noise impacts the odd-numbered residences of Lewis Avenue, whereas Veirs Mill Road traffic noise impacts the odd-numbered residences of Veirs Mill Road, as well as the residences on Coral Sea Drive, Abbott Road, Broadwood Drive, Okinawa Avenue, Ardennes Avenue, and Midway Avenue that are nearest to Veirs Mill Road.

3.11 Watts Branch Parkway – Rose Hill Development (Rockshire, Fallswood, Saddlebrook, Rose Hill, Rose Hill Falls)

Interstate 270 traffic is the dominant noise source to the Watts Branch Parkway and Rose Hill Development study area. A concrete sound wall noise barrier protects the even-numbered residences adjacent to Interstate 270 on the west side of Watts Branch Parkway; however, the loudest-hour equivalent sound level, $L_{eq(h)}$ = 68dBA at these residences. An earth-berm sound barrier protects most of the residences in the Rose Hill Development from Interstate 270 traffic noise; however, the earth-berm sound barrier does not protect the residences near the intersection of Winding Rose Drive and Blue Hosta Way, where the loudest-hour equivalent sound level, $L_{eq(h)}$ = 69dBA. Local traffic noise from Great Falls Road creates noise impacts to the residences adjacent to Great Falls Road on both sides, with loudest-hour equivalent sound levels, $L_{eq(h)}$ = 68dBA.